

## **Acoustic Behavior of North Atlantic Right Whale (*Eubalaena glacialis*) Mother-Calf Pairs**

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### **LONG-TERM GOALS**

The long-term goal of this project is to quantify the behavior of mother-calf pairs from the North Atlantic right whale (*Eubalaena glacialis*) to determine a) why mothers and calves are more susceptible to collisions with vessels and, b) determine the vocal behavior of this critical life stage to assess the effectiveness of passive acoustic monitoring to detect mother-calf pairs in important habitat areas.

### **OBJECTIVES**

The primary objectives of this project are to: 1) determine the visual detectability of right whale mother-calf pairs from surface observations, 2) determine the acoustic detectability of right whale mother-calf pairs, 3) determine the acoustic detection ranges of mother-calf calls through propagation modeling, 4) assess the ontogeny or changes in behavior with calf development, and 5) assess the individual distinctiveness of right whale vocalizations.

### **APPROACH**

This proposal involves a detailed behavioral study of endangered North Atlantic right whale mother-calf pairs to document their activity budgets, movement patterns, and sound production in two critical habitat areas in U.S. waters and a designated conservation area in Canada over the course of entire migration corridor from the Southeastern United States through the Gulf of Maine to the Bay of Fundy. These data will be collected using a combination of passive acoustic recording and monitoring methods coupled with detailed behavioral observations in four months of the year for a period of 5

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years (December-January off the coast of Florida, April – Cape Cod Bay in Massachusetts, and August-September in the Bay of Fundy, Canada). These data will be used to assess the effectiveness of visual and passive acoustic monitoring in detection and tracking of individual whales and how these parameters may change with the development of the calves.

Year 1 will involve preliminary field seasons to test the feasibility and logistics of focal follow methods in each of the three key habitat areas off the coast of Florida, in Cape Cod Bay and in the Bay of Fundy, Canada. Years 2, 3, 4 and 5 will involve more extensive field seasons in each of the three habitat areas to collect behavior on individual mother-calf pairs with the goal of collecting repeated samples from individual pairs in multiple habitat areas and on different days to look at changes in behavior as the calves develop. Analysis of data will begin after the first preliminary fields seasons and propagation modeling will start at the end of the first year with the recruitment of a graduate research assistant at Penn State. It is anticipated that ongoing analysis and presentation of results will continue through the study, with urgent topics (e.g. - call types and parameters for passive acoustic detection of mother-calf pairs) analyzed and published first, and other more detailed behavioral analyses being published as adequate sample sizes are obtained (e.g. surface behavior, ontogeny of behavior, individual recognition of calls).

## **WORK COMPLETED**

During the first six months of the project the equipment necessary for field data collection was identified and obtained, including the vessel platforms and recording and monitoring systems for each field site. A graduate student at Penn State University has been identified and will be participating in the data collection and analysis from the study, including propagation modeling, for her doctoral thesis. Preliminary visits were made to each of the three proposed field sites and included meeting with regional collaborators and testing each of the proposed vessel platforms. These tests included two very successful days of field testing of all recording and observational equipment in the Bay of Fundy in late August 2010 in collaboration with the New England Aquarium right whale research group.

## **RESULTS**

A 3 element towed hydrophone array was successfully deployed from a 7m outboard vessel in the Bay of Fundy, Canada on August 27 and August 29, 2010. The array was easy to hand deploy and recover and towed well behind the vessel at speeds between 1.5 and 4.5 knots in sea states 0-3. On both days, the array was towed behind the vessel during visual focal follows of a mother-calf pair, resulting in 3.5 hours of data. The two pairs were photographed for individual identification. Analysis of acoustic recordings from two focal follows of mother-calf pairs in the Bay of Fundy resulted in the detection of no vocalizations from either pair. The whales were within 200 m of the array during the follows, making it unlikely that we would have missed any sounds produced by the mother-calf pair.

## **IMPACT/APPLICATIONS**

The outcomes of this study will be identification of behaviors that increase the risk for vessel strike of mothers and calves and quantification of the swimming and vocal behavior of mothers with calves to assess both the visual and acoustic detectability of these individuals to mitigate the potential for serious injury to this critical segment of the right whale population from collision with vessels.

## **RELATED PROJECTS**

None